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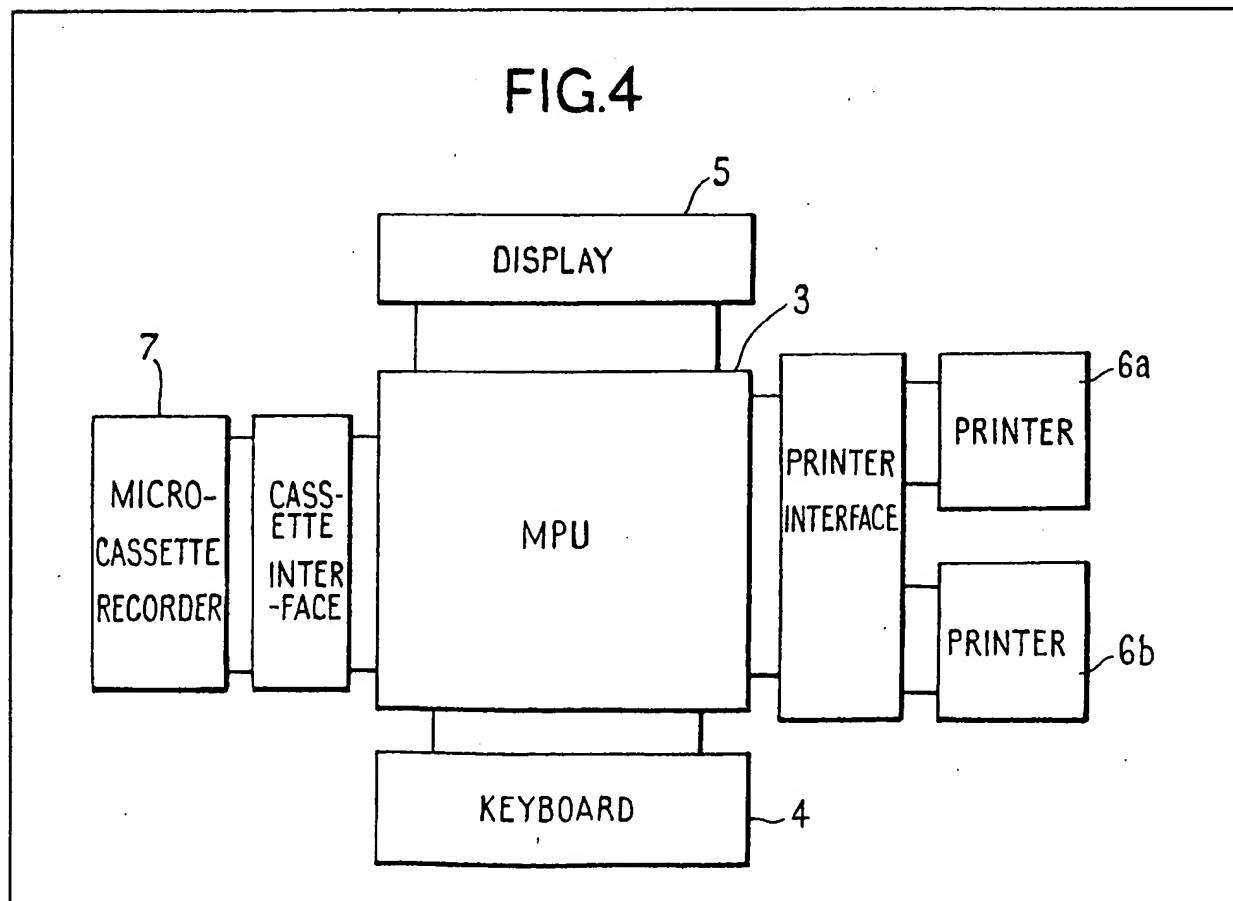
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(54) Data logging and label printing
device

(57) A combined data logging and

label printing device comprises a computer processing unit 3, programmed to drive the various functions of the device, a keyboard 4 for use by the user to input data and interact with the processing unit, a display 5 for displaying the text input by the user and which is to be printed using one of two printers 6a and 6b on label stock and a micro cassette recorder 7 acting as a non-volatile memory for storing data relating to each prepared label. The printers may carry labels which are marked by colour or other marking to distinguish between, say, poisonous and other products. The processing unit 3 is programmed so that unless the user gives instructions to the contrary, a label will normally be printed on one of the printers unless he or she specifically instructs the other printer to be used. The printer normally used can be selected by the user during the start up routine of the device so as to even out wear on the two printers.



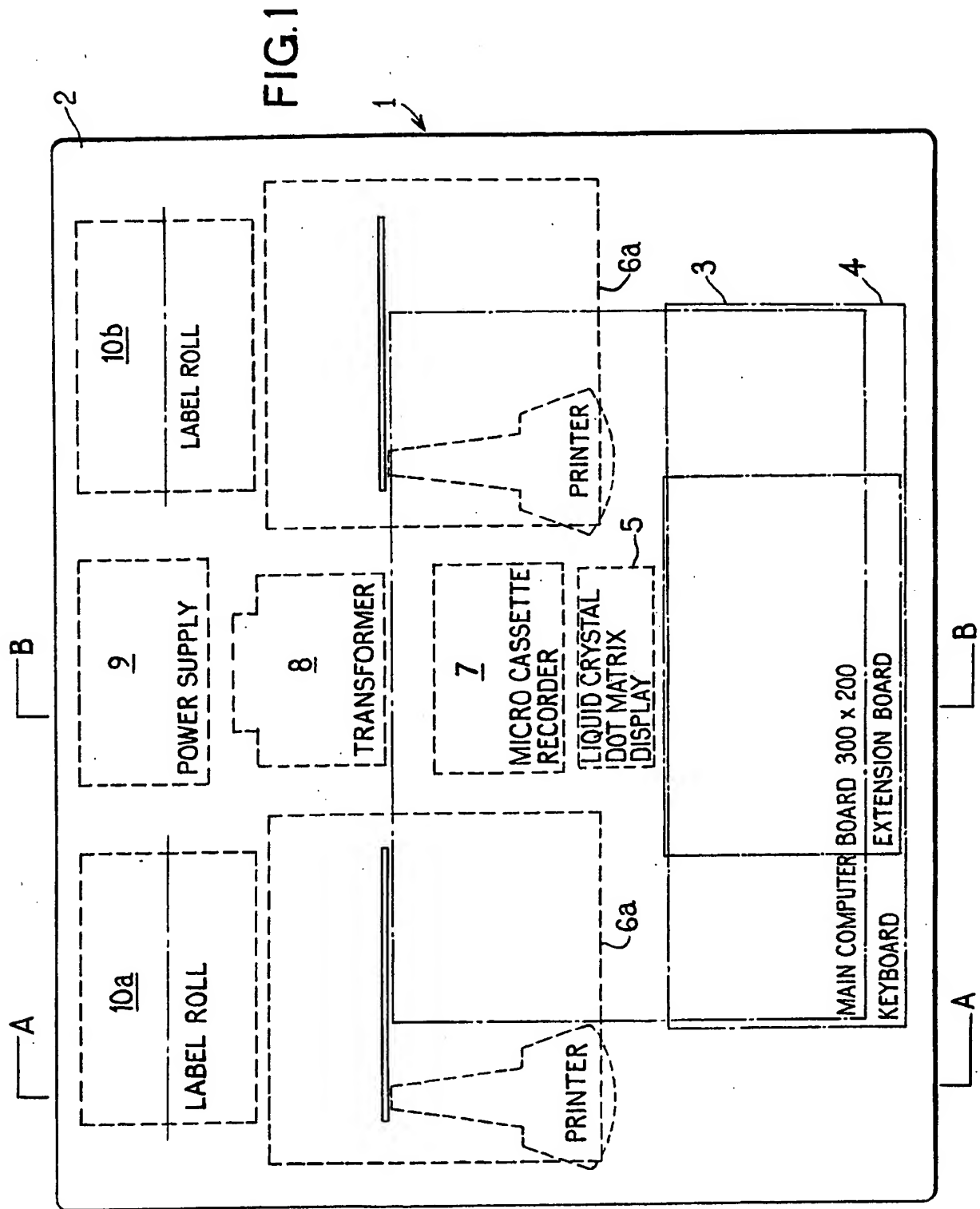
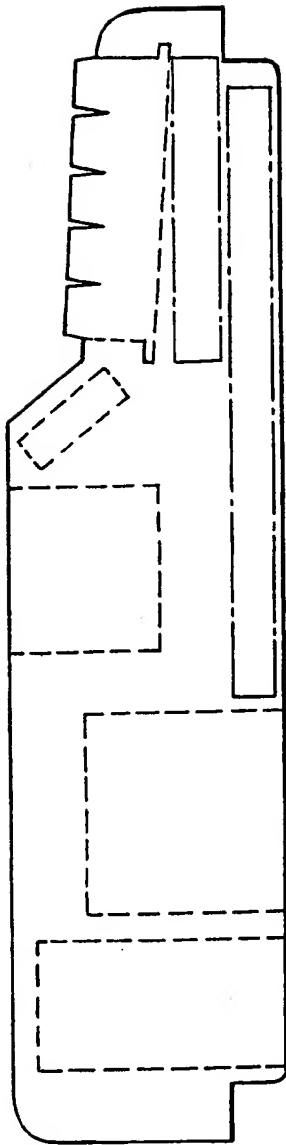
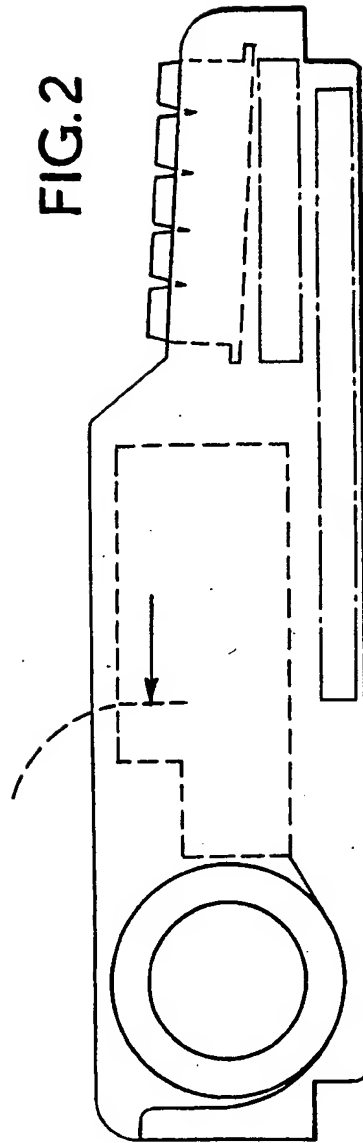


FIG. 3



B—B

FIG. 2



A—A

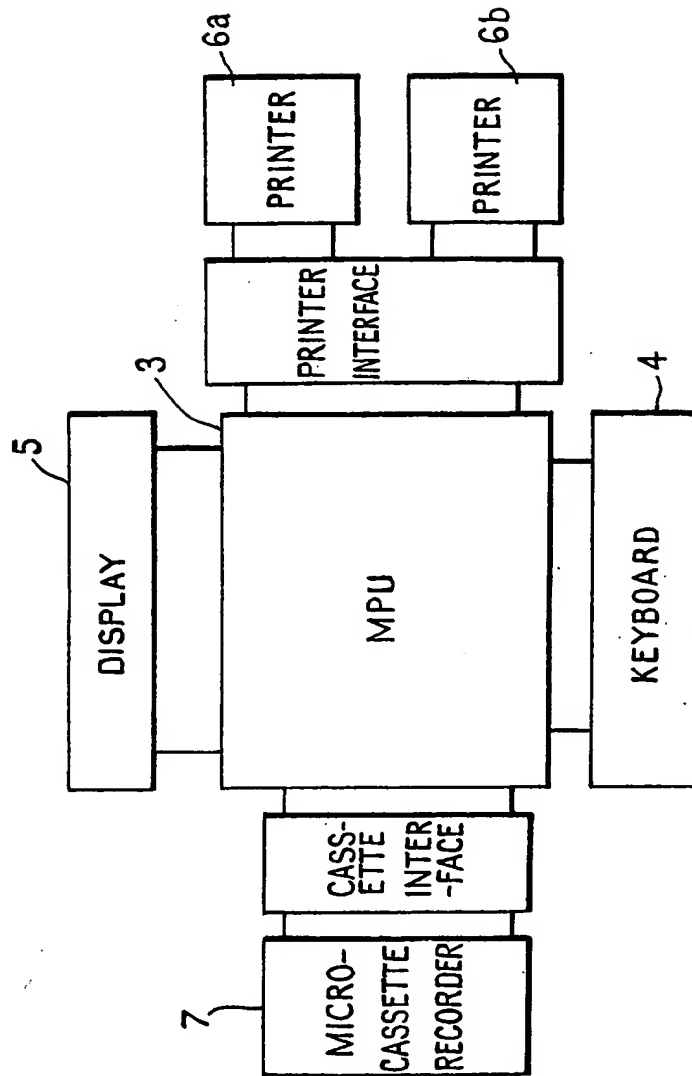


FIG.4

SPECIFICATION

Data logging and label printing device

5 The present invention relates to a combined data logging and label printing device. 5

In many applications it is desirable for products to bear individual labels printed indicating their composition or manner of use and to compile data, for example for stock control, accounts and other record purposes relating to the labels which have been printed. One particular application is in chemists or pharmacists where it is desirable to prepare labels for drugs and other medications and various other items, 10 the label showing the recommended dosage and/or manner of use and identifying the item. At the same time for various reasons it is desirable to compile a record of various data relating to each item which is dispensed. This data can be used for stock control and accounting purposes and also to take account of prescription charges, etc. 10

Broadly, the present invention provides a combined data logging and label printing device in the form of a self contained unit which has a computer processing unit (MPU) for interacting with the user to set up the data for a particular label, a printing arrangement for printing the labels and a data logging arrangement for storing data relating to each prepared label in a non-volatile memory. Preferably the device comprises a keyboard for enabling the user to enter data for the preparation of individual labels and instructions to the microprocessing unit and a display for verifying entered data. 15

20 Different types of labels, for example labels of different colours may be required for example in a chemists application where red labels might be desirable to indicate poisons. Preferably the printing arrangement comprises a pair of printers for printing on labels from respective supplies of label stock, in use individual labels being printed on a selected one of the printers. As one type of label stock may be used much more frequently than the other, the printer printing labels from the default stock may be changed from time to time. For example the MPU may be programmed to have a start up routine in which the user selects one of the printers for the default stock. 20 25

As far as the data logging function is concerned, it is envisaged that data would be compiled over a period of time, say, for example, a week and then be transferred to a central location for processing. For example a number of chemists could be provided with devices and there could be a central place which periodically receives data from them to compile the necessary records. The data logging arrangement in the device should, of course, be of a capacity sufficient to accommodate the data collected before it is "dumped" to the central point and this memory should also be non-volatile. The presently preferred storage is a type of digital micro-cassette which provides non-volatility and also ease of use under control of the MPU. Various other forms of non volatile memory could of course be used such as magnetic discs, e.g. floppy discs, audio cassettes, semi-conductor memories, memories and the like although to provide sufficient storage capacity at an economic costs for use in a chemists application, the digital micro-cassette is presently preferred. 30 35

It is important in some applications such as the preparation of drug labels that the labels are clearly printed and we presently prefer, therefore, to use a sprocket-fed impact printer for each of the two printers in the printing arrangement. Impact printers also have the advantage of not requiring special printing stock, unlike thermal printers. 40

The invention will be further described, by way of example, with reference to the accompanying drawings in which:

Figure 1 is a schematic plan view of one embodiment of the invention;

Figure 2 is a section on A-A in *Figure 1*;

45 *Figure 3* is a section on B-B in *Figure 1*; and

Figure 4 is a block diagram of the logical connection of the hardware of the device of *Figure 1*. 45

As shown in *Figure 1*, the device 1 is in the form of a self-contained unit comprising a housing 2 of suitable materials such as plastics and containing all the functional parts of the device. The principal functional parts are:-

50 A main computer board 3 having a microprocessor and suitable support clips mounted thereon and an extension board with additional support chips thereon the board 3 may carry or have associated with it an amount of non-volatile RPM in which user-set data (e.g. frequently used names and addresses and so forth may be stored. Such a facility may be provided by a battery backed CMOS RAM with a charging circuit to recharge the battery during mains operation; 50

55 A keyboard 4 to the normal QWERTY layout and having control keys to enable the user to set up the data for a particular label to be printed and also to give instructions to the microprocessor unit; 55

A dot matrix type liquid crystal alphanumeric display 5 which displays the text entered by the user for printing on the label, as well various other data which may be stored by the MPU and also displays messages from the MPU to the user;

60 A pair of sprocket fed impact printers 6a and 6b for preparing the labels; 60
A micro-cassette recorder 7 which is used for data logging;
A mains transformer 8;
A power supply 9; and
Two label stock rolls 10; and 10b.

input from the keyboard and to control the display 5, printers 6a and 6b and micro-cassette recorder 7 and carry out the various labelling, data logging and other functions described below.

The keyboard 4 may be of any suitable type for example one of those which produces a ready encoded ASCII strobed parallel output encoded serial output, or it may simply comprise an array of contacts which are scanned and debounced by the MPU.

The printers 6a and 6b are preferably forty character per line printers of the DP 824S type made by Star of Japan and the micro-cassette recorder 7 is preferably of type MD3 also made by Star.

The following is a description of the functions which the MPU 3 may be programmed to provide when applying the device to the preparation and logging of labels in a chemists.

This section is concerned with the way the system appears to work from the point of view of an operator or any external equipment. It is not concerned with how this is achieved.

The principal areas of concern are the formats of labels and of captured data, the information presented to the user and the actions he is expected to carry out.

The system will recognise certain short forms of popular drug names and common dosage information.

These abbreviations may be entered by the chemist via the keyboard 4 but are printed in full on the label. The form in which the drug is dispensed (e.g. tablets, cream, syrup, etc) is also entered by the chemist as an abbreviation.

The device 1 incorporates two print mechanisms 6a and 6b intended to allow both black and red (for poisons) label stock to be loaded at the same time. In practice the red label stock is likely to be much less often used and the chemist is therefore recommended to vary which one of the two mechanisms which will print the default stock. In consequence, part of the start up procedure which must be carried out after switching on the unit is to ask the chemist to specify whether the left 6a or right hand printer 6b contains the black labels.

In order to load labels into one of the printers printer, or to adjust the position of the first line of print, the sprocket feed mechanism must be operated. This can be done via the keyboard during start up, or following a label wreck, or just before printing in the event of the label roll running out. Also a dummy label can be printed to enable the user to check label alignment.

Labels can only be printed when all the data has been entered.

The labels used are pre-printed, in black or red, with a chemist's logo, address and other details. Sufficient area preferably exists for printing up to six lines of information, each line containing a maximum of twenty-five characters.

Preferably, the device 1 has the facility to prepare five types of labels, namely standard labels, statistics labels, price-tickets, free text labels and dummy labels. Examples of the format and use of these are given below, these examples are purely illustrative and many other formats and uses are possible.

The first line contains the prescribed drug name and optionally its strength and form. The drug name is printed wholly in upper case characters and is contained within the line. The next four lines contain the specific dosage instructions in full. Key words or characters may be printed in upper case. The final line contains the patient's name and the date on which the drug was dispensed. For example:-

AMPICILLIN 250 mg Capsules	30 Caps
TWO to be taken THREE TIMES	
DAILY before food	
Mr. A. Malady	10 Apr 81
THE CHEMIST	Tel: 72047
Mill Lane, Taplow, Berks.	

The quantity can be printed optionally above the drug name line. The positioning of the quantity and/or date information can be varied. Similarly, in a variant, additionally a serial number may be printed. In such cases the serial number can be printed where the date currently appears and the date is then printed on the last seven characters of the last dosage line.

Using red label stock, 'For External use only' may be pre-printed on the top line of the label. Some embodiments may allow the user optionally to select the cautionary message to be printed by the machine.

Statistic Labels

During the start up procedure or during normal running, the chemist may invoke an alternative to the program for printing standard labels. The machine is programmed to maintain counts of the labels dispensed within its memory and on the tape. The chemist may, therefore, print a label containing statistics relating to the dispensing information.

The following illustrates the layout of one version of a statistics label.

	Date: 10 Apr 81	Forms	Items	
5	Paid	26	32	5
	Non paid	14	18	
	Exempt	12	14	
10	Contraceptive	28	40	10
	(12X) TOTAL	<u>70</u>	<u>104</u>	
15	THE CHEMIST	Tel 72047		15
	Mill Lane, Taplow, Berks			

Facilities may exist within the program for clearing and/or adjusting this statistical information so that the chemist can maintain accurate daily and monthly dispensing statistics.

The information printed may include the data of the first and last recorded labels plus the following totals:

- * number of scripts (prescriptions)
- * number of scripts exempt from charges
- * number of labels
- * number of scripts issued by a GP
- * number of scripts issued by a dentist
- * number of scripts issued by a hospital
- * number of scripts issued by a private organisation
- * number of scripts issued by another authority

Price Tickets

Another routine programmed into the machine is to provide an alternative to the standard label routine is that the chemist can use the device for printing price tickets for any product lines he wishes. These price tickets can be dated and include the industry code for the product being priced. Each price ticket is "x" and separate rolls of these tickets are produced with rows of six labels across. Thus:-

	333336	333336	333336	333336	333336	333336	
	5.99	5.99	5.99	5.99	5.99	5.99	
40	10 Apr 81	10 Apr 81	10 Apr 81	10 Apr 81	10 Apr 81	10 Apr 81	40

The chemist can optionally specify whether the date or the industry code for the item (e.g. 333336) is printed on the label. Additionally, the chemist specifies how many price tickets should be printed for a specified price.

Free Text Labels

These may be made available when the dispensing label format is not wanted (e.g. for patient's addresses). After a special character is entered to a specific prompt, the device becomes a typewriter which can print 27 characters on 6 lines of each label.

Dummy Labels

A dummy consists of six lines of characteris, predefined by the machine, used to check the correct positioning of the label stock in the printing mechanism.

Obviously, in the normal course of operation, the standard label format is used, with data being entered by the user via the keyboard. The preparation of statistics labels may be initiated via the keyboard, to data for each label being compiled by the MPU 3. The dummy label option may be selected via the keyboard e.g. during start up to check label alignment.

The micro-cassette recorder 7 can use both sides of a cassette tape. One possible tape format for data logging is as follows:-

Tape Format

Each side of a cassette tape is treated logically as though it were a separate tape volume. Each recorded tape volume has the following logical format:

	Volume Label Record	- This contains a unique volume identifier, a count of the number of times the tape has been used, and a flag to indicate whether this is a "scratch" tape i.e. available for re-use.	
5	Tape Mark Header Record	- The type of header record present identifies the use of the tape e.g. label data, test program etc.	5
10	Tape Mark Data Records	- There may be several types of data record present on a tape, depending on its use.	10
	EOT (End of Tape)	- This consists of two consecutive standard tape marks. Any data recorded beyond EOT is invalid and was probably written during a previous use.	
15	The tape format was designed with the following points in mind:-		15
	A tape can be "scratched" after processing without destroying any data records. This can therefore be done in a single pass with recovery possible in the event of a subsequent error.		
20	Each physical tape unit can be monitored by the central processing facility so that, for example, it can be withdrawn before its life expectancy is up.		20
	Tapes may have a variety of uses other than recording labels.		
	<i>Record Formats</i>		
25	Each record tape is distinguished by its first byte which contains one of the characters A through Z. All the data in every record consists of printable characters.		25
	<i>Volume Label Record</i>		
30	This record contains 40 bytes, starting with the letter V. If the second byte of this record contains the letter S then this is a "scratch" tape and the entire record will be re-written with this byte changed to a space character when it is loaded into the secondary device.		30
	The remainder of this record contains a tape serial number of various statistical information, such as the number of times the tape has been issued. None of this information is processed by the MPU 3.		
35	In the event of a tape being read which does not begin with a Volume Label Record, the MPU 3 will write a dummy record containing all space characters and the tape will be treated as a "scratch" tape.		35
	<i>Header Record</i>		
	This record is also 40 bytes long, unused bytes being space filled. Two types of header record have currently been identified.		
40	If the first byte contains the letter H then the tape is being used for recording chemists labels. In this case the next four bytes will contain the chemists' number and this is followed by a four number identifying the device 1 and the data of the first recorded label (six digits).		40
	If the first byte contains the letter P then the tape contains a program which the MPU 3 will automatically load into its random access memory and execute. The facility may be included to assist the testing of the device 1 during production and subsequently. It can also be used for general applications.		
45	<i>Data Records</i>		45
	The maximum length of a data record is constrained by the cassette controller to be 256 bytes.		
	Program data records will contain a printable form of hexadecimal data, such as TEKHEX for example. The format of these records is not currently defined.		
50	Label data records begin with the letter L and contain information relating to one or more chemist labels. The second byte contains a digit representing the number of labels in this block (maximum value, 3). The next six bytes contain the date on which the labels were printed in the form ddmmyy.		50
	Each label in a label data record consists of a number of fixed length fields. These are, in order:		

	FIELD NAME	NO. BYTES	CONTENTS	
	SERIAL NUMBER	4	machine generated prescription count	
5	MULTIPLE LABEL COUNT	1	for multiple item perscriptions, range 1 - 9	5
10	SOURCE	1	digit representing GP, hospital etc.	10
	AUTHORITY	1	digit representing doctor, receptionist etc.	
15	DOCTOR'S NUMBER	7	currently blank	15
	BRAND	20	name/abbreviation	
	STRENGTH	5	alphameric (e.g. 250 mg)	
	FORM	2	numeric	
20	QUANTITY	5	numeric, includes decimal point	20
	PACK SIZE	4	numeric	
25	DOSAGE	8	dose abbreviation	25
	GENERIC DRUG	20	name as entered	
30	Two conditions are detected by the MPU 3 which require the user to replace the cassette or to turn it over. The appropriate message is displayed. In the event of the unit displaying the following message: **TAPE FULL THIS SIDE			30
35	the user should turn over the tape if the other side has not been used, or insert a new tape. If an irrecoverable error is detected by the unit while trying to read or write the tape (or if no tape is loaded), the following message is displayed: **TAPE ERROR, PLEASE REPLACE			35
40	and the user should try a new tape or check that a tape has been correctly inserted. Repeated occurrence of this message with several tapes indicates a malfunctioning device 1. When a tape has been turned or changed, following either message, the user should hit ENTER on the keyboard 4 and wait for the system to respond with the next message.			40
	<i>System Operation</i>			
45	<i>General</i> Each input of data by the user is requested by a prompt on the device display 5. Usually the prompt is in the form of a question. There are a number of ways in which the user can reply. As far as possible, the number of keystrokes is minimised. The following functions are required:-			45
50	✓	signifies a key designated to means YES		50
	X	signifies a key designated to mean NO		
55	Enter	signifies a key used to depart from the sequence of operations		55
60	Cancel	signifies a key used to abandon the current label input - this may be used in reply to any prompt		60

5	Backspace	signifies a key which will delete the last character typed by the user which is currently on the display - it can therefore be used to correct typing errors as they occur but only on the current input line.	5
10	Clear	signifies a key which will free the keyboard after it has become inoperable following an input error detected by the system.	10

In general, if an input error is detected the system will stop accepting characters from the keyboard 3 and displaying them until CLEAR is used when the original prompt will be re-displayed.

15 The operational flow of the system is presented in the remainder of this section in the form of a hierarchical sequence of steps. Each step corresponds to a system prompt and shows the allowable responses, any special action performed and the consequent next step. 15

This procedure is obeyed each time the system is switched on. Embodiments may vary in the complexity and sophistication of procedures invoked in this start up routine. One example of the routine is as follows.

20	Step	Prompt	Reply	Action	Next	20
	200	TODAYS DATE:	ddmmyy	Enter date	300	
	300	Scripts?	√	Prescription labelling	330	
25			X		310	25
	310	Ticketing?	√	Price Ticketing routine	3000	
			X		300	
	330	Adjust left printer?	√		3000	
30			X		340	30
	340	Adjust right printer	√		2100	
			X		400	
35	400	Black on left?	√		410	35
			X		500	
	410	Print date?	√	Here if scratch tape only	420	
			X		420	
	420	Print Quantity?	√		430	
			X		430	
40	430	Chemist.No?	√		400	40
			X		400	

Label Processing

45 This procedure is entered after start up and is repeated from each new prescription processed. Where a prescription requires several labels the multiple label count is decremented as each label is printed and the procedure returns to step 700 until the count is zero. 45

The following is one example of this routine. Models vary in the way this routine operates. Drug names may be either entered in full or by using one of the abbreviations held in the machine's memory which is subsequently printed in full on the label. Machines may vary in the number of abbreviations which they hold. 50
Currently their range would probably be from 50 to 800 products. Some versions may take advantage of the CMOS memory to provide the facility to the chemist for adding abbreviations of his own choice. 50

	Step	Prompt	Reply	Action/Note	Next	
5	500	SOURCE:	1 ch		510	
	510	EXEMPT?	√ X		520 520	
	520	AUTHORITY	1/3 ch		600	5
	600	PATIENTS NAME	26 ch ESC	Enter name Multiple labels	700 610	
	610	HOW MANY LABELS:	d	Max.9	600	10
10	700	FORM:	1/2 ch		710	
	710	DRUG NAME:	25 ch	Abbreviation or full name. Use of '@' symbol automatically prints previously entered form		15
15	800	DOSAGE:	107 ch	Abbreviation and/or free text	800 900	
	900	QUANTITY/PACK SIZE:	≤ 8 ch 8 ch		1000	20
	1000	IS NAME GENERIC?	√ X		1010 1100	
25	1010	BRAND USED:	≤ 25 ch			25
	1100	PRINT BLACK	√ X	Prints black Prints red	1200 1200	
	1200	OK?	X ESC	Record on tape	500/700 1300 1250	
30	1250	HOW MANY DUPLICATES?	d	Enter maximum of 9	1200	30
	1300	VERIFY?	√ X	See note blow	- 1310	
	1310	ADJUST PRINTER?	√ X		2000 1200	35

In the verification routine each element of the label is displayed, if 'YES' is given in response the entry remains unchanged; if 'NO' is given in response the respective prompt is redisplayed and the required information re-entered.

Printer Adjustment

This procedure is entered to reload either printer mechanism with a label roll of dispensing labels or price tickets, to adjust the position of the first line of printing on a label or to allow labels to be reprinted in the event of a label wreck.

	STEP	PROMPT	REPLY	ACTION/NOTE	NEXT	
50	2000	LINE FEED,	1	One line feed	-	50
		PAPER LOAD,	p		2010	
		TEST	t	Print dummy label	-	
55	2010	ESC	ESC	To leave routine	340	
		HIT SPACE BAR		Mechanism operates automatically	2000	55
		TO START AND STOP				

The chemist may continue with this routine until the dummy print is correct and can only exit by pressing ESC.

Recognised Abbreviations

General

MPU 3 is preferably programmed to recognise certain abbreviations input from the keyboard; the number of recognised abbreviations may vary. Some of these are printed in full on the label and some cause special

Source

A single character abbreviation is used for this value, as follows:

	Value Typed	Meaning	Value Recorded	
5	G	G.P.	1	5
	H	Hospital	2	
	D	Dentist	3	
	P	Private	4	
10	O	Other	5	10

Authority

This represents the status of the writer of the prescription and also whether or not it is exempt from charges. The values are as follows:

	Value Typed	Meaning	Value Recorded	
15	P	Professional	1	15
	A	Ancillary	2	
20	O	Other	3	20
	P/E	Professional/Exempt	6	
	A/E	Ancillary/Exempt	7	
	O/E	Other/Exempt	8	

25 Drug on Label 25

If an abbreviation is entered, then this is compared with a table of the most frequently prescribed drugs which gives also the full drug name. The full name is printed and also recorded on the tape.

Embodiments may vary in the number of abbreviations which they hold in memory.

Form

30 The value recorded on the tape is a two digit number corresponding to the position of the Form in the list (e.g. Aerosol is 00, Cream is 05). 30

Dosage

Dosages are entered as a mixture of standard abbreviations and free text. The abbreviations follow the latin commonly used by doctors when specifying prescriptions.

35 Any free text included in the typed dosage string is not recorded on the tape. 35

CLAIMS

1. A combined data logging and label printing device in the form of a self-contained unit which has a computer processing unit programmed for interacting with the user to set up the date for a particular label to be printed, a printing arrangement for printing the labels and a data logging arrangement for storing data relating to each prepared label in a non-volatile memory. 40

2. A device according to claim 1 and which comprises a keyboard for enabling the user to enter data for the preparation of individual labels and instructions to the processing unit and a display for verifying entered data. 45

3. A device according to claim 2 wherein the display is arranged to be driven by the processing unit which is programmed to display prompt and/or other interactive messages to the user.

4. A device according to claim 1, 2 or 3 wherein the printing arrangement comprises a pair of printers for printing labels from respective supplies of label stock, in use individual labels being printed on a selected one of the printers. 50

5. A device according to claim 4 wherein the printers are arranged to dispense the printed labels exteriorly of the unit.

6. A device according to claim 4 or 5 wherein the processing unit is programmed to have a default mode whereby label printing will take place via one of the printers unless the user specifically instructs that a particular label is to be printed on the printer. 55

7. A device according to claim 6 wherein the processing unit is programmed so that the printer to be used for default printing can be selected during a start-up routine.

8. A device according to any one of claims 4 to 7 wherein each printer is a sprocket fed, impact printer.

9. A device according to any one of the preceding claims wherein the processing unit is programmed to accumulate data relating to printed labels and temporarily store it in RAM and to periodically dump the accumulated data to the non-volatile memory. 60

10. A device according to any one of the preceding claims wherein the non-volatile memory is a digital micro-cassette.

11. A device according to any one of the preceding claims wherein the processing unit is programmed to prepare statistics relating to printed labels and to display the prepared statistics 65

12. A device according to claim 11 wherein the processing unit is programmed to output the prepared statistics via the printing device.

13. A device according to any one of the preceding claims wherein the processing unit is programmed to recognise abbreviations in data input by the user and to replace the abbreviation by data stored relating to
5 the abbreviation.

5

14. A combined data logging and label printing device constructed and arranged to operate substantially as hereinbefore described with reference to and as illustrated in the accompanying drawings.

15. A device according to any one of the preceding claims when programmed for the preparation of labels for items dispensed by a pharmacist and/or chemist.